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TEA CULTIVATION
IN CEYLON

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PREFACE TO FIRST EDITION.

The chief aim of this Essay is to offer some information on "Pruning," and kindred subjects of importance in the cultivation of Tea, and to avoid most details already known to practical planters.

My endeavour also is to create a desire for more knowledge of the scientific as well as the practical side of the subjects treated in this Essay.

EDWD. HAMLIN.

April 8th, 1903.

PREFACE TO SECOND EDITION.

The first edition of this little book has met with a welcome reception both in India and Ceylon; the Press criticism in both countries has been kind, and the extracts of letters from leading planters, now re-produced, will suffice to show that the book should be useful to Tea Planters for many years to come.

The first edition having been exhausted within two months of its publication, I have arranged with Messrs. A. M. & J. Ferguson, the proprietors of the "Ceylon Observer," to print and publish a second, to which is added some remarks to bring the information, on one or two matters, up-to-date.

I have taken some trouble to ascertain the names of the purchasers of the essay—two copies were bought in Calcutta by Dr. Shepard of "Pinehurst," America, and it is a significant fact, that, in nearly every case, it is the *experienced* Planter, and not the younger generation, who has sought information; it is to the latter, I therefore dedicate this second edition in the hope that, after a perusal, as Mr. F. L. Clements remarks in his letter, the reader will "not have wasted his time but have gained some useful information and food for reflection."

EDWD. HAMLIN.

Darrawella, December 17th, 1904.

Ten copies were bought by Messrs. Freudenberg by the request of their friends in Germany.

August, 1913.

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TEA CULTIVATION IN CEYLON.

ESSAY ON PRUNING.

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TESTIMONIALS.

The following are extracts from a few out of many letters received from leading planters and short extracts from reviews published in planting papers; also a copy of the full review published by the "CEYLON OBSERVER."

SUNNYCROFT, RUANWELLA, 8th Oct., 1904.

MY DEAR HAMLIN,—I have read your Pruning Essay with much interest, and I think that both theoretically and practically it is an excellent work. I quite agree with all you write about cheap and nasty pruning and the amount of damage done by want of attention to the details of this important work. Plucking, too, is a work that does not receive nearly enough attention, and in my opinion there is far too much pulling about of the bushes and plucking of immature flush.

I agree with you about manuring, in so far as I prefer *forking to any other methods*, and that is a good point you make always forking towards the bush.

I am quite at one with you as to the great difficulty in getting manure properly applied, and I could write sheets on this very subject and with some experience, as I believe this is the most highly-cultivated estate in the whole island.

I hope we shall meet some day, when we can discuss all these matters, and if you would like to run out here some day by the K. V. Railway, I can show you much that would interest you.—Yours sincerely, W. FORSYTHE.

DIKOYA ESTATE, DIKOYA, November 19th, 1904.

MY DEAR HAMLIN,

I have read your Essay on Pruning with great interest, and in my opinion you have made the theory of scientific pruning so clear that Planters should not have much difficulty in greatly improving their pruning in practice. Your illustrations, facing page 24, are to my mind particularly useful, and can be seen on any field in Ceylon, if looked for. I would recommend your Essay to anyone interested in pruning.—Yours sincerely, TOM VILLIERS.

STEUART HOUSE, COLOMBO, 11th October, 1904.

MY DEAR HAMLIN,

Thanks very much for sending me your Essay on "Pruning" which I have read with great interest. It is crisp, concise, and to the point, and I am puzzled to know why it should have been passed over by the Judges.*

*It was stated by some of the Judges my Essay was understood to be "not for competition."—E. H.

It would have been well, I think, if the Planters' Association had selected a few of the rejected Essays for publication.

I am glad to hear that your contribution to the Tea Literature of the island is finding its way into so many bungalows, and hope the 2nd edition, which you contemplate bringing out, may meet with a ready sale.

There is much in the Essay to attract and interest the thoughtful Planter.—Yours very truly, EDWD. S. GRIGSON.

DARRAWELLA, DIKOYA, 17th June, 1903.

"I have carefully read your Essay on Pruning, and I must say the style of the work is excellent and the contents thoroughly interesting from start to finish.

I think the advice and instructions contained in your book will be of the greatest use to planters as well as to estate proprietors who are not practical planters."—(Sgd.) G. HEDGES.

12TH NOVEMBER, 1904.

"Rustic's" Essay on Tea Cultivation is a valuable addition to existing literature on this subject. The chapters particularly on the "Uses and Action of the Leaves" and on "Pruning"—usefully illustrated—are excellent and worthy of the careful attention of young as well as of older planters. In this case it is no conventional phrase to say that every planter should have a copy.—(Signed.) A. H. DUNSMURE.

KATOOGALLA, November 18th, 1904.

MY DEAR HAMLIN,—I received your letter and a copy of your Essay on Pruning just as I was starting on a round of visiting. I read it first in the train and again to-day, and I consider it contains more sound common sense and useful information than the published Essays. It is not to be expected that everybody will agree with every dictum expressed; and with the raw material planters have to work upon in Ceylon, and the limited expenditure they are allowed, some of your advice may assure theoretical rather than practical tendencies; but any man who is interested in his subject will, after reading your Essay, put down the pamphlet with the satisfaction that he has not wasted his time and has further gained some useful information and food for reflection.—Your sincerely, F. L. CLEMENTS.

NAWALAPITIYA, 26th September, 1904.

I got your Pruning Essay from Brown & Co., Hatton, yesterday; allow me to offer you my congratulations on giving the planters such sound practical advice gained from actual experience. These are days of theorists and scientists, both good if coupled with practice.

I was not a competitor myself, but if you competed for the prize, I cannot understand why it was not placed.—(Signed) R. TURPIN.

COLOMBO, 5th September.

After reading your Essay again, I venture to say yours is the best pamphlet on Tea Pruning that I have read, and one I should be glad to have if I were up-country again. Your description of how not to prune is admirably lucid. Your diagrams are A1. I have sent a copy of your Essay to our London office. —(Signed) A. A. PRIDEAUX.

UDA PUSSELLAWA, September 27th.

Your Essay I thought exceedingly good and most practical in every way.—(Signed) D. CRABBE.

DIMBULA.

"I don't consider either of the Pruning Essays a patch on yours for practicability—too long and wearisome, whilst yours is concise and very much to the point!"—(Signed) HAROLD GORDON.

BOGAWANTALAWA.

"I write to thank you for a copy of your Essay, which I was very pleased to get: it is quite the best I have seen, and sound." —(Signed) A. C. BONNER.

LINDULA, September 27th.

I invested ~~Rs~~. 1-50 on your Essay on Pruning, &c. Pity you did not publish it years ago, and save the many hundreds of acres of tea that were allowed to grow into mop-like structures, before being cut down at 2½ to 3 years old.

I like the Essay very much, its all sound; your illustrations are good and figure H. is splendid. I have seen acres of that sort of pruning.—(Signed) W. H. GRAHAM.

DIKOYA.

"Many thanks for the loan of a copy of your Essay on pruning tea. I wish I could keep it, as even after twenty years of tea planting and twenty-six in Ceylon, I find there is much to learn and even more to *un*learn, after reading your admirably expressed brochure."

"Should you publish your Essay, I hope you will let me know where I can obtain copies, as I should have them kept by all my assistants and conductors."—(Signed) G. A. PALMER.

LINDULA.

"Many thanks for the Essay which I have carefully read twice, and fully appreciate. If you send me a dozen copies over, I could easily dispose of them."

HAPUTALE.

"Very many thanks for your Essay on pruning which I read last night, and was very pleased with; it is clear and to the point, and I feel I have learnt a thing or two."—(Signed) H. O. HOSEASON.

HATTON.

"I think that Hamlin's Essay is, to say the least, better than any of the three prize ones, while the sixth chapter—'The Practical Pruning of Tea' of his monograph, reads much better than anything in the other Essays. I am impressed with the diagram on page 17; and the sheet of illustrations facing page 24, with explanations, is so clear, that even the greenest of creepers, though a fool, need not err therein."—(Signed) R. WILLIAMS.

OOTACAMUND, NILGIRIS.

The Hon'ble Mr. H. P. Hodgson writes as follows under date 28th August last:—"Many thanks for sending me a copy of your very interesting Essay on Tea Pruning, which I have carefully read and fully appreciate; your Essay should, I think, have a ready sale, and I shall advise my planting friends to buy it."

After reviewing the Ceylon Prize Essays recently published by the "Times of Ceylon," the "Indian Planting and Gardening," Calcutta, in a full review, stated:—"In the book now before us by 'Rustic'—a man of keen observation and wide perception evidently—there is a freshness of view that makes the pamphlet worthy of wide notice. There is sufficient of argument, too, to sustain interest and carry one to the end of the last page wishing for more." It concludes as follows:—"To those who are sick of reading Essays on Pruning, we would say, read one more, that by 'Rustic';—beg, borrow or steal the little book, but read it, and the author will equally have attained his object. It is only necessary to add that the author is Mr. Edward Hamlin."

In the "Times of Ceylon," ex-Ceylon Planter says:—"The Essay is well worth reading, and the illustrations should be of real value to the young pruner."

The "Madras Times" and the "South of India Observer" published full and highly favourable reviews of the book.

Mr. Alex. Cameron wrote on the 26th July, 1910, as follows:—

"Many thanks for your Essay on Pruning and Kindred Subjects," I have read it with great pleasure and interest and I think the pruning part of it knocks spots out of any of the pruning Essays and I have read them all."

(From the "Ceylon Observer," August 27th, 1904.)

We notice in the "Indian Agriculturist" of August 1st that complaint is made of 'Rustic'—the author of the tea-pruning essay that has been attracting so much attention lately—that he takes refuge behind a *nom de plume*. But this *nom de plume* is no longer necessary as the essay (which can be obtained at this office) now bears the autograph stamp of Mr. Edward Hamlin, the well-known Darrawella planter. Mr. Hamlin's career as a practical planter, both in India—for 23 years—and in Ceylon (for 17), makes the strained quintessence of his experience, more especially as it is stated in the simplest language, the most persuasive form and yet with clear scientific knowledge underlying it, of the utmost value to planters of every age,—but especially to the *young* planter, as having a greater capacity for making mistakes. We can cordially re-echo the Calcutta expression of opinion we quoted upon this short work, not long ago, namely: if you have read other "pruning essays," forget them all for the time being and read, nay learn, this one; or at any rate grasp the principles it displays—principles of natural growth, but as specially observed in the tea plant, by one whose language breathes an atmosphere of almost affectionate vigilance—with such tenacity that they *must* be put into practice. With the care of a scientist who knows that one section of a big subject like Tea Cultivation cannot be considered distinctly and apart from other sections of it, Mr. Hamlin begins by handling the rudiments and taking his readers on by easy stages to the heart of his strange and intensely interesting matter. The action and use of leaves is described in an opening chapter in such a way that when one has at length realised the circulation of the sap to the leaves (through which perspiration, respiration and digestion take place) and its return to the wood, the very thought of careless plucking, so as to injure the capacity of the tea bush for these functions, or neglect—resulting in the functions being sluggishly performed, becomes to the serious tea-planter a deadly professional sin. Before proceeding further Mr. Hamlin makes it plain, how manure may restore the life of the plant that is taken off with the young leaves; but is very particular in his detailed instructions as to application, ensuring that no part of the bush or its roots can suffer thereby. A short paragraph on the burying of prunings, discountenancing the practice, as has been taken up in India as opposed to the view of the Ceylon authority, Mr. Bamber; but Mr. Bamber, it will be remembered, modified his opinion latterly, and Mr. Hamlin specially mentions that he has had little experience of the use of basic slag with prunings buried. Mr. Bamber, too, was one of those who—before this Essay of Mr. Hamlin's was printed (like Mr. Hamlin's work in the Society of Arts Show, it was "not for competition," but not by any wish of the author in this case!)—urged that he should publish it and endorse the bulk of its teaching. The short chapters devoted to "drainage" and "plucking" elucidate the connection of these branches of Tea cultivation with that of pruning in a very marked degree; and the advice that all immature leaf should be retained on the tree should be memorised by every S.D. and Manager who personally trains his coolies. Then we come to

the Theory of Pruning: a title that suggests the advisability of a little skipping—but to skip this part would be the height of error. The pruner, it is shown, has to lessen the number of leaves and branches, so as to concentrate the plant's vitality in what remain; but unless he studies the laws prevailing here, and discerns the subtle truths of growth as affected by vegetable surgery, his work might count for nought. It is in Chapter VI. "Practical Pruning of Tea" that the raw student finds what he wants and what is in turn wanted of him. Dr. Watt, it will be seen, agrees in this particular: that as with a child the training should begin from the very earliest years; after the first year, Mr. Hamlin says. Next, we have the successive stages, level to which and ages at which to prune—all so lucidly set forth in detail by diagram and explanation, that the intelligent planter should not fail to be convinced: and further, to rejoice that he has been convinced. Mr. Hamlin carefully avoids dogmatising; but nevertheless gives it as his mature decision that the "early establishment of a good bush" (*i.e.*, by stopping after 1½-year, and by connected operations) is "of paramount importance." The last chapter but one is the most entertaining, as well as one of the most luminously practical; and it follows out what has been said earlier in the essay as to getting a tea bush into *order* before making it yield heavily. The entertaining portion is where Drs. Watt and Mann are taken to task for speaking of the wound at a section as *healing over*. This Mr. Hamlin, with several times as long acquaintance (even in India alone) with the tea bush itself as the skilled Indian experts, rightly insists to be a false doctrine: such a wound never heals—and that is why the Tea Bush must be cut down, namely, to clear away snags and obstructions. The concluding chapter deals very briefly, but authoritatively, with collar pruning. The whole essay, as we have tried to show, is exceedingly complete, yet brief. This brevity could not have been attained, but by the most skilful boiling down of the cream of nearly half-a-century of experience, spread over scores of tea-fields; and to those tea planters who have not read it, we would say, write at once to us for a copy of perhaps the best obtainable and most readable statement on the subject today.

TEA CULTIVATION IN CEYLON.

ESSAY ON PRUNING.

CHAPTER 1.

" For the dead leaves of autumn are the organic elements out of which the leaves of summer are to be restored in the mysterious laboratory of vegetation."—*Dr. Lindley.*

ACTION AND USE OF LEAVES.

BEFORE proceeding to the consideration of the subject of this essay, I would like to discuss with my readers other points which directly influence the Tea bush, and which are, in fact, quite as important to its health and development as pruning; but in order that my remarks may be followed, I think space should be devoted to a description of " the action and use of leaves."

To every one who takes an interest in the operations of nature, the development of every sort of agricultural produce, whether in the plantations in the east, or the fields in the west, must be a source of wonder and admiration, and, for the purpose of illustrating the system of growth, decay and recuperation going on, nothing can be more typical or beautiful than " the action of leaves."

The functions of respiration, perspiration and digestion which are the particular use of leaves, are essential to the health of a plant; its healthiness being in proportion to the degree in which these functions are duly performed, consequently whatever tends to impede the free action of leaves tends also to diminish the healthiness of the plant. These functions are performed by means of the vital forces of vegetation, assisted by the agency of air and solar light.

Carbonic acid is originally introduced to the interior of a plant, either dissolved in the water it imbibes by its roots, or by attraction from the atmosphere, or by the combination of oxygen resulting from the decomposition of water, or from other sources with the carbon in its interior; when a leaf is exposed to the direct influence of the sun, it gives off oxygen by decomposing the carbonic acid; whereupon the carbon remains in the interior of the leaf in a solid state.

Circulation of the Sap.

The office of the stem is to convey the crude fluid obtained by the roots into the leaves for digestion or assimilation, and then to receive it back again in an elaborated form. This fluid contains in solution nitrogen as nitrates, as well as mineral substance derived from the soil.

When sap leaves the earth and passes into the stem, it ascends by the woody matter of the finest fibres of the roots and flows into the new wood with which those fibres are connected, and passes along until it reaches the leaves, where, as I have before stated, it is elaborated; on its return from them it descends through the liber, in part passing off horizontally towards the centre through the medullary rays. Wherever it passes it deposits a portion of its solid parts, and consequently that portion of the wood, namely, the "heart," will have the greatest quantity of matter accumulated within it.

In the course of time, however, a leaf becomes incapable of performing its functions; its passages and surface are choked by the deposit of impurities; there is no longer a free communication between the parenchyma and that of its rind or between its veins and the wood and liber, or the air and its interior; it changes colour, ceases to decompose carbonic acid, absorbs oxygen instead, *gets into a morbid condition, dies and falls off; but its use, or functions, do not end here, the fallen leaf is loaded with mineral matter taken from a depth, and in the form of leaf mould is finally offered to the surface spongelets as nourishing matter to sustain the parent tree.*

It is obvious that the more vigorous the roots and the more healthy the wood on the tea bush, the more complete will be the circulation of the sap and the greater stimulant to flush, provided the growth of wood is kept within certain limits.

The tea bush is not a deciduous plant and therefore would come under the denomination of evergreen, which parts with its

leaves more slowly than the deciduous species, and so the functions of the leaves are going on during our tropical winter, *i.e.*, the dry weather; although languidly they are constantly attracting sap from the earth through the spongelets, and are therefore in a state of slow but continual winter growth. The perspiratory organs are less active than in the deciduous species.

The functions performed by leaves are not very generally known and consequently not appreciated; this is my excuse for attempting, though briefly, to describe them.

CHAPTER II.

MANURING.

THE object of manuring is to restore, or retain, the fertility of the soil, to increase the sap in the bush, and to enable it to grow healthy wood with the ultimate object of obtaining strong flushes of leaf; also, if practicable, to improve quality.

Pruning is the art of removing scientifically certain branches, or part of them, with a view to control and utilise the sap to the same end; it follows, therefore, that two operations are closely allied.

Roots. Although information is already available on the subject of artificial manure, it may not be out of place to remark on the manner best to apply it, for it must be obvious that it cannot be of much use unless it is in contact with the absorbing parts of the roots; now these parts are the young fibres and spongioles, and when plants have arrived at any considerable size, the roots form the radii of a circle, whose circumference is the principal line of absorption. This being so, if the plant has arrived at the state of a bush, it is useless to apply manure to the base of the stem, because that is precisely where the power of absorption is the weakest, if it exists at all; and as the circle formed by the roots is generally greater than that of the branches, the proper manner of applying manure is to introduce it into the ground at a distance from the stem, about equal to the radius formed by the branches.

Owing to the varying nature of the land, no arbitrary rule should be laid down. When the conformation is fairly flat, and the land is free from rocks, the quantity of manure prescribed should be sifted out of a small measure round the bush, and the more it is thoroughly spread the better, as a spongelet can only assimilate a certain quantity; the ground should then be carefully dug over with a *shallow* three-pronged fork: great care must be taken that the work is well done; when digging, the coolies should always face towards the bush they are otherwise apt to dig across, and thus break the large roots.

Considering the volatile nature of most chemical manures, I would strongly recommend, especially in doubtful weather, the use of semi-circular trenches about 4 inches deep and 30 inches

in length, or even longer where the ground is suitable; the manure should be thoroughly mixed with the soil and then pure earth placed on the top; this system would cost from two to three rupees per acre more; but, on sloping land, the money would be well spent as "insurance," for, no doubt, it is the more certain method.

On very precipitous or rocky land, a good method is to puncture with a three-pronged fork—the prongs about six inches in length—nine holes, about three inches apart, and into these small holes the fine manure should be sifted and covered up; the rain will do the distribution.

When to Apply Manure

It will generally be found on old estates where heavy pruning has been necessary, that the manure should be applied at the time or even before the pruning has commenced; but on the second and following prunings the manure should be applied about six months after the pruning is finished. Applied too early, a superabundant growth of succulent shoots is the probable result; these have to be headed back, and much of the growth goes in the objectionable tippings. Quality of wood and not a superabundance of weak shoots is what should be aimed at.

If the manure be applied some six months after the operation of pruning has been completed, the bushes would then be in a better condition to utilise it to the best advantage, for at this period they would be in full leaf and vigorously absorbing plant food, a condition greatly advantageous to the formation and growth of the all-important hazel-like wood. The effects of the manure should also be more permanent.

As regards the season when manure should be applied, we are not always able to choose our own time, owing to the uncertain labour supply and the exigencies of plucking and other works; then there are the many wet days from the end of May till October, when it would be unwise to apply chemical manure; but it may be taken, as a rule, the manure should be put out, if practicable, when vegetation is most active, and this would apply to each individual estate.

I have found more difficulty in getting the application of chemical manure carefully and efficiently done than any other work, not excluding pruning; I, therefore, recommend much European and personal supervision of this important field work.

Before closing this subject I would advise every planter before applying any special mixture on a large scale to experiment

on small plots till he finds the right chemicals and their proportions. I can say, from a very long experience of these manures, that analysis of soils has seldom or ever helped to solve the problem; but, in my opinion, with careful experiments the time is not far distant when quality will be restored or, at all events, greatly improved on some of the old estates which possessed quality within the last decade.

Burying of Prunings.—My experience of this work extends to a good many estates. I may have been unfortunate, but I must admit that I have never seen any appreciable benefit derived from this work, and briefly I would strongly advise most planters instead of burying prunings to utilise the nitrogen they contain, to spend the money in the purchase of chemical manure, which will give to the soil as much, if not more, nitrogen and other fertilisers. Fungoid pests would also be avoided, and so also would "wash," where the land is inclined to be steep. I must, however, state I have had but little experience of the use of basic slag in conjunction with the disposal of prunings.

Since the foregoing was written in April, 1903, there has been considerable controversy on the subject of burying tea prunings. The most recent contribution to the press was an able review of the subject by a well-known planter, Mr. Henry M. Alleyn, who stated on the 2nd December instant as follows:—"The whole question is one of great importance to the Ceylon tea industry, but as far as one can judge, very little decisive evidence has so far been brought forward to justify the burying of prunings."

CHAPTER III.

DRAINAGE.

IN my last chapter I advocated manuring as a valuable adjunct to "pruning," so likewise is "drainage." If you wish to give your estate the full benefit of the artificial manure, many catch drains are necessary, and care should be exercised to see they are not cut at too steep a gradient, for the silt will contain a valuable collection of chemical manure which might otherwise be lost.

We are aware that most fertilising materials act upon plants through the medium of water. The water or moisture on the ground dissolves small quantities of the mineral ingredients, and conveys them to the roots of the plants; but, in order that water may perform the office properly, it must circulate or traverse the soil in different directions. During rain, the water falling on the surface will pass downwards through the soil. In fine weather the evaporation from the surface will impart an upward tendency to the moisture; but, in whichever direction this moves, it will carry with it small quantities of the manuring materials it has dissolved from the fragments of those substances it has met with at different points of its course; and, being everywhere intercepted by the roots, it yields to these delicate organs as much of the material it has gathered as they are inclined to make use of; but in compact and heavy soils, where the water is more or less stagnant, or incapable of circulation, the fragments of manuring substance become enclosed in a layer of standard material, and all those particles not immediately adjacent to the roots of the bushes take no part in contributing to the growth for the time being.

Draining, therefore, is the first and most important means at our disposal for the improvement of all descriptions of land, in which an undue proportion of water prevails; in short, all the resources of scientific measures will be useless unless a proper amount of water is maintained in the soil, and the removal of a superabundance is provided for by artificial drainage.

CHAPTER IV.

PLUCKING IN RELATION TO PRUNING.

I SHALL, in Chapter VI., advocate gentle treatment of the young tea plant, as regards the use of the knife, to bring it into a well shaped bush, and I must now plead forbearance in the matter of "plucking," for I am of opinion that, as a rule, it is suicidal to pluck the young bush before it has attained the age of nearly four years. The life of the plant will depend chiefly on the treatment it gets up to this period.

Climatic Influence.

Climatic influence has more to do with plucking than any of our planting operations, and the absence of a few inches of rain at certain periods, especially between January and March, will considerably affect the outturn in most districts.

Immature Leaf.

Plucking, after all, is nothing less than a modified nature of pruning. In some districts hard plucking assists the flow of sap at certain periods, but, at all times, it is very essential a manager should be careful to retain all *immature* leaf on the bush, as on this depends the free circulation of sap and the length of period the bush will continue to flush well.

Beware, therefore, of hard treatment such as stripping off all young leaves, even during a period of vigorous growth. One often hears that the flush has "shut up," and bad treatment too often is the cause. Planters should bear in mind that the climate of Ceylon gives very little rest to the unfortunate tea bush.

There is now a laudable tendency to spend more money on the cost of plucking, and I have no doubt, in all respects, benefit will accrue.

Before pruning, pluck *lightly*, for a few weeks, as experience shows this precaution favourably influences an early return to bearing; the bush, however, may be stripped immediately before using the knife.

CHAPTER V.

THE THEORY OF "PRUNING."

WHAT the planter wants is, not a treatise on botany, nor a series of speculations upon the possible nature of the influence on plants of all existing forces, nor an elaborate account of chemical agencies, inappreciable by his senses, and obscurely indicated by their visible results; but an intelligent explanation, founded upon well ascertained facts, which he can judge of by his own means of observation of the general nature of vegetable actions, and of the causes which, while they control the power of life in plants, are themselves capable of being regulated by himself. The possession of such knowledge will necesssarily teach him how to improve his method of cultivation, and lead him to the discovery of new and better modes.

The quantity of wood that a tree forms, the amount and quality of its secretion, the brilliancy of its colour, the size of its flowers and, in short, its whole beauty depend upon the action of its branches and leaves, and their healthiness. The object of the pruner is to diminish the number of leaves and branches; thus it may at once be understood how delicate are the operations he has to practise, and how thorough a knowledge he ought to possess of all the laws which regulate its actions. I can imagine some readers of this Essay remarking—"We do not want the scientific side, we require a practical Essay on the pruning of the tea bush," but I contend that pruning has too long been practised without knowing "the reason why!" and a knowledge of vegetable physiology would have long ago dispelled some of the crude theories and fallacious creations set up by men even of long experience!

A great authority once wrote—"Although there have been many good gardeners, entirely unacquainted with the science of vegetable physiology, and although many points of practice have been arrived at altogether accidentally, yet it must be obvious that the power of regulating and modifying knowledge so obtained cannot be possessed unless the external influences by which plants are affected are clearly understood; indeed, the enormous difference that exists between the skill of the present race of gardeners and their predecessors can only be ascribed to the general diffusion that has taken place of an acquaintance with some of the simpler facts in vegetable physiology."

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From personal knowledge I can state there are scarcely any books on "Horticulture" or "Agricultural Chemistry" to be found in the homes of the Planters, and it is my desire in this Essay to endeavour to arouse an interest in the scientific side of our work; pruning, manuring, and, in fact, all field works yield ample scope for intelligent observation, and far from being monotonous they should yield a wide field of instructive results; my small library of such books has contributed for many years to my enjoyment, and also to what I have now written.

Sir George King, one of the ablest writers on the subject of pruning, published an article in the "Agri-Horticultural Society Journal" in 1871, which concluded as follows:—

"It is thus that pruning becomes the necessary sequence of plucking if healthy young leaves fit for tea making are sought to be continuously produced. The end in view should never be lost sight of when using the knife, for the mere meaningless mutilation of a plant by its application is quite as likely to be hurtful as not."

CHAPTER VI.

PRACTICAL PRUNING OF TEA.

IF well-directed pruning is one of the most useful, and, if ill-directed, it is among the most mischievous operations that can take place upon a plant, my advice is, attain knowledge, and fear not !

The object of our tea pruning is to utilise the sap in such a manner that well-nourished young leaves may be produced abundantly; also to promote free circulation of the sap, and consequently the growth and extension of healthy brown wood to carry a succession of crops of good quality leaf. This can only be done by the removal of useless wood. Knowledge of the principles of pruning and the habit of the tea bush are highly necessary, and also practical manipulation with the pruning knife.

Topping.—It has been a matter of surprise to me that the system survives which obtained twenty years ago: does it never strike a planter when he cuts down the tall pyramidal bush that the fine healthy wood lying on the ground ought to have remained where it came from, but in the form of a well-spread handsome tea bush ? This could have been secured by a little skilful manipulation between the age of 18 months and 3 years, known as "stopping," whereby the plant would have gradually assumed the form desired.

When branches are removed much of the vigour of a tree is removed too, its power of growth is more or less impaired, and the operation defeats the object it is intended to serve. But when branches are merely stopped no loss is incurred; all that happens is that growth ceases in the direction of the stoppage, and the sap which would have been expended in forming the shoots whose growth is arrested is impelled into other shoots, or more correctly into that one which is intended for a leader.

I should like to illustrate the system fully, but the topping of Tea is not of frequent occurrence now; however, I refer to it in a quotation of my views written some years ago. I observe now that Dr. Watt alludes to the system in the following terms:—

" The Tea Planter has thus to change completely the natural habit of the plant. There is no use of closing the eyes to the fact,

The sooner, therefore, that the plant is made to assume the condition most suited to the arbitrary demands of the cultivator, the better for its future life. It is, in my opinion, both an unnecessary delay and a hurtful proceeding to indulge the natural proclivities of the plant for two or three years and then suddenly force it to assume a condition altogether unnatural." The same authority also wrote: "The shock to the stem of being pruned down to 9, 12, or 18 inches from 6 feet is practically as severe as a collar-pruning. The risk of a snag of a most damaging nature is, moreover, extremely great."

The following is an extract of what I formerly wrote and published on the subject:—"With a view to avoiding the necessity of heavy cutting early in the life of the plant, I would suggest the abandonment of the system, more or less in vogue, of allowing the bushes to grow for three years and upwards before topping them."

"Taking old seed-bearers, since cut down and plucked for some years, as a guide, I have, till within the past few years advocated the above method, arguing that the establishment of a strong tap root should be of primary importance in the future of the tea bush. With further experience and observation I now doubt the wisdom of that system."

"It may be considered as a certainty that the younger the plant the less will the shock be of its first pruning. Let the two systems—first 'stopping' at a year, and first pruning at three or four years be compared in the fifth year of the plants, and I assert the comparison will be in favour of the early rather than the late system."

"If, as I think, it should be the aim of the planter to avoid heavy pruning as long as possible, much will have been gained by stopping early in the young wood, for, in the case of a three or four year old plant, the stem would have become thick, and the 'topping' form the first 'snag' or peg in the coffin of that plant; for the tea bush, although it makes an effort, is powerless to cover the wound, and the first instalment of dry rot is established. Every subsequent heavy, and often injudicious, pruning produces more snags and further decay in the branches of the tree. On the other hand, careful manipulation from one to four years old would

result in a well-formed bush with strong primaries, and, with medium cutting it would go on producing good flushes. In the fifth year a well-furnished bush would have, in my opinion, a better future than the one which, at the same age, has started with snags, and the attendant consequences of dry rot, initiated by topping and pruning at four years."

"The foregoing applies to young estates. The question now arises, what can be done with old estates where the bushes are suffering from exhaustion, engendered by continuous heavy pruning, with a view to maintain the yield? Later on I will endeavour to show; but with the tea bush not so far gone, I believe much can be done by judicious removal of diseased wood and *a rest from plucking*, to improve the bush and promote its return to good flushing condition. To this end, I have found in practice the great advantage of only tipping down to 7 in. the centre of the bushes, leaving the outside shoots to mature to strong brown wood, later on operating on them and reducing to the pruning level with the knife. In this manner, the resuscitation of old tea has been demonstrated and further maintained by the retention of *only* the thickest of the brown wood and cutting out the whippy shoots, which only take sap and give little leaf in return. I am strongly of opinion that leaf grown on the stout healthy brown wood is of better quality than that plucked from sickly shoots. What I mean will be understood by a study of the functions of the leaf and its power of elaborating the sap."

"I strongly advocate regular, and, if necessary, severe pruning, backed with manure, to get neglected bushes into order. I do not mean hacking and slashing, but careful selection, and, above all, careful and, I might say, dexterous use of the knife; but in doing this work, the season must be carefully selected, as great damage sometimes results from the exposure of the primaries. I have seen many fields where the bark has blistered; in consequence, the 'cambium' was destroyed and dry rot followed." I have found it a good plan, in the dry season, to place the prunings on the top of the bushes. The *shade* is very beneficial.

System of Pruning.

I have heard it stated that tea planters would probably wish to have a "*system*" of pruning explained, but, to my mind, there is nothing wrong with the present one in vogue, so far as it goes

and so long as the general principles of pruning are observed and encouragement to the growth of "snags" is carefully and systematically avoided.

What is required first, and every intelligent gardener will tell you, is a knowledge of the habit of the plant, its construction, circulation of the sap, and the use of leaves, roots, &c.; and, secondly, practical experience in the manipulation of pruning, in order that the Planter may readily teach his coolies all he knows himself.

It is of the utmost importance the coolie should be taught to use discrimination, in order that each bush, within certain limits of uniformity, should be treated according to its needs.

Considering the small amount of money spent per acre on this important work, the wonder is that more damage is not done; nevertheless, damage is done and frequently to a grave extent, as evinced by the number of decaying snags visible on the bushes.

Intelligent coolies are very quick at picking up the details of pruning, but, if otherwise, what can be expected? especially when an ignorant Canganie is in charge of them, whose sole idea of the subject is to see that the bush is cut to a level; that is the beginning and end of his science; he has never been taught the existence and use of a "node," and that to cut cleanly close above one is a first principle of pruning! It is not his fault if he has never been taught, neither is the coolie to blame if nearly the whole of his day's work is represented by some thousands of "snags."

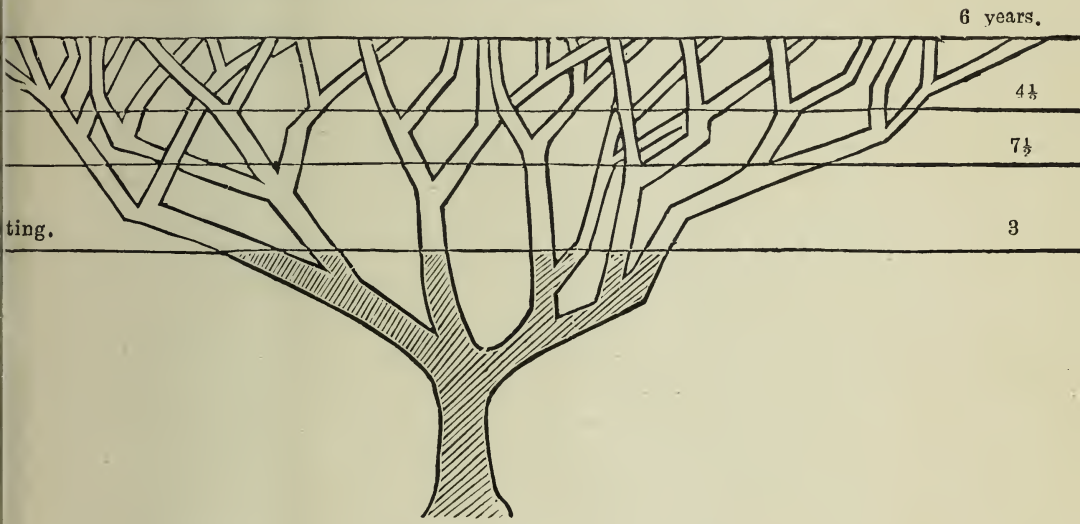
Under the head of "topping" I have given my views on the treatment the young plant should receive to bring it to a three-year old bush, when it should receive its first proper pruning.

Owing to its gentle treatment by judicious "stopping" up to the third year, it is now a symmetrical bush, and I would add, presumably of a good jât; it has, at this period, a good supply of strong wood to select from.

At this important stage the coolies and the pruning knives should be of the best. First of all, see that no growth is left on the stem near the ground for fully six inches, should any have grown since the first shaping of the bush was begun. Some Planters will say, Why remove this growth? My reply is, these

low branches add nothing to the yield; they impede the circulation of the sap and keep out light and air from the centre of the bush and, moreover, attract pests; they are practically "gormandisers," and are apt to run to seed: remember, light and air are absolutely essential to the growth and development of stout brown wood.

My advice now is to proceed to cut out cross wood growing towards the stem, and retain a sufficiency of the best which may be found growing in the right place, for it is on such wood the future upward prunings have to rely; consider that lateral growth is only necessary to support vertical shoots, which really supply the sap to the leaf and promote flushes.



Now for the manipulation of the knife: find a node as near as possible to the general level it is proposed; hold the branch or single shoot firmly in the hand and make the section as illustrated at A, in the annexed sketch, at the same time avoid all the examples of how not to prune: a node is not always easy to detect, but one is pretty safe to be found within four inches, therefore, do not fall into the grave error of making the section too short, for cutting *below* the node means that the snag will rot back in to the main branch and cause destruction of the framework of the tea bush.

The above sketch will serve to illustrate the system I recommend for the purpose of establishing fine tea bushes at seven years; it may, however, be objected to on financial grounds, by delaying the plucking, but the treatment I advocate will repay the proprietor tenfold if he follows out my suggestions as illustrated above.

The plucking would begin after the first pruning and between the age of 3 and 4 years and so on up to 7½ years, when the first cutting down would take place, but note the fine framework in the diagram; it will be observed that 6 inches are left between the 1st and 2nd cutting, but this is done in anticipation of the fourth pruning, which will establish the framework of a fine bush, due chiefly to the careful treatment it has had since it left the nursery.

If the pruning has been carefully done there should be no snags in the framework, and, as regards roots, there should be plenty and of vigorous growth.

I do not wish to dogmatise on the subject, for I am perfectly aware that modifications would have to be made in the above to meet varying conditions of soil and climate, and also, unfortunately, financial exigencies, but I maintain that the above treatment will produce a much finer bush than the present system of suddenly cutting down a tall bush at 3 years of age. I have gone rather fully into the subject because I consider the early establishment of a good bush of paramount importance.

The reason it becomes absolutely necessary periodically to cut down a bush to a low level is because the sap in its upward and downward course is impeded and deflected by the snags which have formed in the stem and branches, and it is imperative that the obstructions be removed. Good pruning is the only remedy, and when a stem has become rotten or choked with impurities, I recommend collar-pruning, of which I shall write in the next chapter.

Tipping.

Some 3 or 4 months after the first proper pruning, or at the time the manager judges it best, the process of tipping should begin; I have already quoted an extract of my views on this operation. I am aware that the system usually adopted is to tip straight down to about 7 inches, but I prefer to let the shoots run until brown wood has begun to show at the base.

The next "tipping" should be to about 7 inches, but only in the centre of the bush to let in light and air, and later on the outside vertical shoots should be levelled with the knife, but the section should always be made just above a bud. By this mode of treatment the planter will be rewarded by a growth of stout

brown wood without much extra expense; he will also avoid the harvesting of a large quantity of tippings which contain but little material in their sap to produce good liquor. Another advantage, an important one, is that *root* growth will be encouraged and steadier flushes of better quality should be plucked at a later stage.

This system of "pruning" and tipping can be again adopted in a *modified* form at the third and fourth pruning and tipping, but, in the former case, care must be taken to adopt the cut as indicated at figure A.

I have, in the foregoing, taken my reader to the 4th pruning as indicated on the sketch, and leave him with a well-shaped and carefully nurtured bush.

When unfortunately it becomes necessary to cut a bush down, endeavour to leave a few healthy branches untouched in order to influence the circulation of sap; later on, when new wood has grown, these branches can be pruned.

uence of vation.

Now the question becomes purely one of locality; in the high districts with almost virgin soil the planter can keep his bushes high and enjoy immunity in regard to pruning, in some cases as long as three years; not so, however, at a lower elevation; indeed, it seems the lower one grows tea the more frequently the knife has to be used; and, obviously, the process tends to exhaustion especially as the soil and climate are not generally so suitable.

It is all a question of degree, and no arbitrary methods should be enforced, for, naturally, every planter should know the needs of his own particular estate and the influence of climate better than a man not educated to the locality.

uence on lity.

It will generally be found that the quality of tea will improve according to the length of period the sap has run from pruning, and also on the quantity and quality of the brown wood it has passed through; slow growth means more perfect elaboration of the sap, and results in better quality tea; it appears to me, therefore, a planter should spend liberally on the application of manure to supply nutritive elements to support brown wood rather than rely too much on the cutting with the knife to compensate for the impoverished supply of food at the roots; but, as I have frequently stated, every planter must judge these matters for himself, for a

system of cultivation which bears excellent results in one district might prove quite unsuitable in another. I reiterate pruning and manuring must be worked consistently one with the other.

Quality of Tippings.

The reason tippings make poor quality of tea is owing to the absence of matured leaves, and there are no means available by which the necessary chemical changes can be effected and which I have described as the elaboration of the sap.

Best Time to Prune.

The best season to prune is when the sap is below, but do not let the bush run itself down, as it were, and come almost to a standstill. As I remarked before, the tea plant is an evergreen, and although it attracts the sap at all times, it only does so at this period in a languid manner. Avoid pruning in May and in the S.W. monsoon if possible.

CHAPTER VII.

THE MANIPULATION OF PRUNING.

IN order to illustrate "good" and "bad" pruning I append some sketches.

Skilful gardeners at home have but one way of performing the former operation; their method may be called "the clean cut," and consists in removing a shoot by means of a sloping wound forming an angle of 45°, just at the back of a bud as at A. The reason is, that as soon as the bud pushes, this wound is readily and rapidly covered with wood. In some trees it will, in fact, heal over in a few weeks, but *the Tea bush* is formed of hard wood, and no such result as complete cicatrising takes place after the plant leaves the nursery.

The above operation of pruning fruit trees or bushes, such as the gooseberry, raspberry, or the currant in England, although the objects to be obtained are different, inasmuch that they prune for fruit and we perform a similar operation for leaves, still the principle of scientific pruning should be observed with the Tea bush, and we should exercise just as much thought and care as they do.

It is, however, true that the fruit trees respond to skilful treatment in a more definite manner and, altogether are better subjects on which to operate; the "habits" of the different fruit trees are more distinctly defined and, therefore, better understood. The tea bush, varying according to the jât, is apt to produce eccentric results; for instance, it frequently occurs that when a section has been made correctly, and at the right place, the result produced is a cluster of small shoots, and the next bud, sometimes two inches below, has produced a healthy shoot which, except in extraordinary cases, should have come above. I gather from this circumstance that the "nodes" vary in value and strength and thus create a difficulty in formulating rules for pruning. The weak "nodes," in my opinion, are due to partial exhaustion of the bush, and the application of manure is the remedy. I am writing now with several specimens of eccentric shoots before me.

Anticipating the difficulty of making all my readers readily grasp the evil effects of "snag" pruning, I have attempted to sketch examples, and have attached the result of my efforts to this Essay, and also a description, at the end of this chapter.

I would add a suggestion as regards the style of Tea bush one has to deal with; it will be found fairly certain that the better the jât the easier it is to prune and retain in good order; but the lower types have one important characteristic—they are hardy and stand severe treatment; but taking the varieties as a whole, I know of no other plant that is asked to submit to similar wear and tear, especially such as obtains in Ceylon. Owing to the forcing climate, the Tea bush gets little or no rest; when it is not being pruned it is being plucked, except for a few months; even at that period it is pushing out new shoots.

As this chapter is devoted to the manipulation of pruning, I here quote the following interesting telegram cut from a Colombo paper last month:—

"A NEW BOOK ON TEA PRUNING."

By Messrs. Watt and Mann.

From the Scientific Standpoint.

"Calcutta, March 7, 10-10 a.m.

"There has just been issued a book on the 'Principles of Tea Pruning,' by Messrs. Watt and Mann, dealing strictly with tea pruning from the scientific standpoint. The authors state that the absence of supervision is one of the chief causes of deterioration. The garden requires forethought and skill, and demands careful and constant supervision. If the knife is inserted below the base of the bud, and a long slanting section is made, the bud will be starved and produce a sickly shoot. If the section is made at the point—say from half an inch to two inches above the bud—the protruding section will be starved and die accordingly. This is generally known as the 'snag' state. When in the spring the sap ascends, accumulation takes place near the topmost bud, and it bursts into foliage, the leaves commence the process of assimilating. *Had the section been properly made, the elaborated sap would have (in a short time) caused the bark to heal over the section and extend into the new shoot until the existence of a wound practically disappeared.* This is necessary to the well-being of the plant, for upon the new shoot probably several flushings depend."

The above paragraph will be found in "The Pests and Blights of the Tea Plant," a most excellent and instructive work published in Calcutta by Dr. Watt as far back as 1898; the telegram at this date is curious and certainly belated.

The italics in the above message are mine, and for many reasons I regret I cannot agree with Dr. Watt that, "had the

section been properly made, the elaborated sap would have (in a short time) caused the bark to heal over the section and extend into the new shoot until the existence of a wound practically disappeared." The "theory" is admirable, but in practice my experience is that after pruning, no matter where the cutting is made, the bark does *not* cicatrise over the section and extend into the new shoot. Were this the case, it would revolutionise our pruning, and the period at which a bush would have to be cut down could be considerably extended.

So far from the wound being healed over "in a short time," I find wood which has been pruned as long as two years has made no effort to recover by healing over, and in no single instance have I seen a Tea bush cicatrise successfully; unless the wound does heal in a short time and the new bark effectually and completely cover the wound before the old wood begins to die, it is useless. It is an axiom in physiology that "live tissue cannot form an organic union with that which is dead," and the process of decay is unavoidable; therefore, it follows as a necessity, for our purposes, the Tea bush must at intervals be cut down in order to clear away all snags and obstructions.

It would appear that a system of periodical pruning and tipping is the only practical one open to us, but, if scientifically performed, these operations should contribute to our gain without causing injury to the health of the tea bush. I quite agree with Dr. Watt as to the manipulation of pruning, and if "snags" are avoided, so much the better for the plant, but I am bound to acknowledge the bush in Ceylon will not respond to pruning in the manner he describes, though it would occur in spring in England with plants having soft wood.

Finally, as regards manipulation, be careful to avoid snags, but, having them, cut them clean out; also be careful to prune as in example A in the sketches, and you will have adopted the correct method. Although the wound does not heal, the sap will not be seriously checked, and should flow unimpeded into the shoot.

Illustration. I now ask my readers to go through the sketches with me.

A This represents the clean cut adopted by skilful gardeners at home and the one I recommend for tea pruning; being made just above the node, the sap flows direct into the new shoot.

a The result of the above is a strong shoot.

B The cut was made too low, and the result is a snag.

b In consequence of the snag and the stoppage of the sap, a sickly shoot has resulted.

C The "slivering" cut in which a long ragged shave is taken off the branch, much too low in the beginning and too high in the end. The style of cutting is a favoured one by the coolie, and is much in vogue, especially on the low shapeless plants of bad jât.

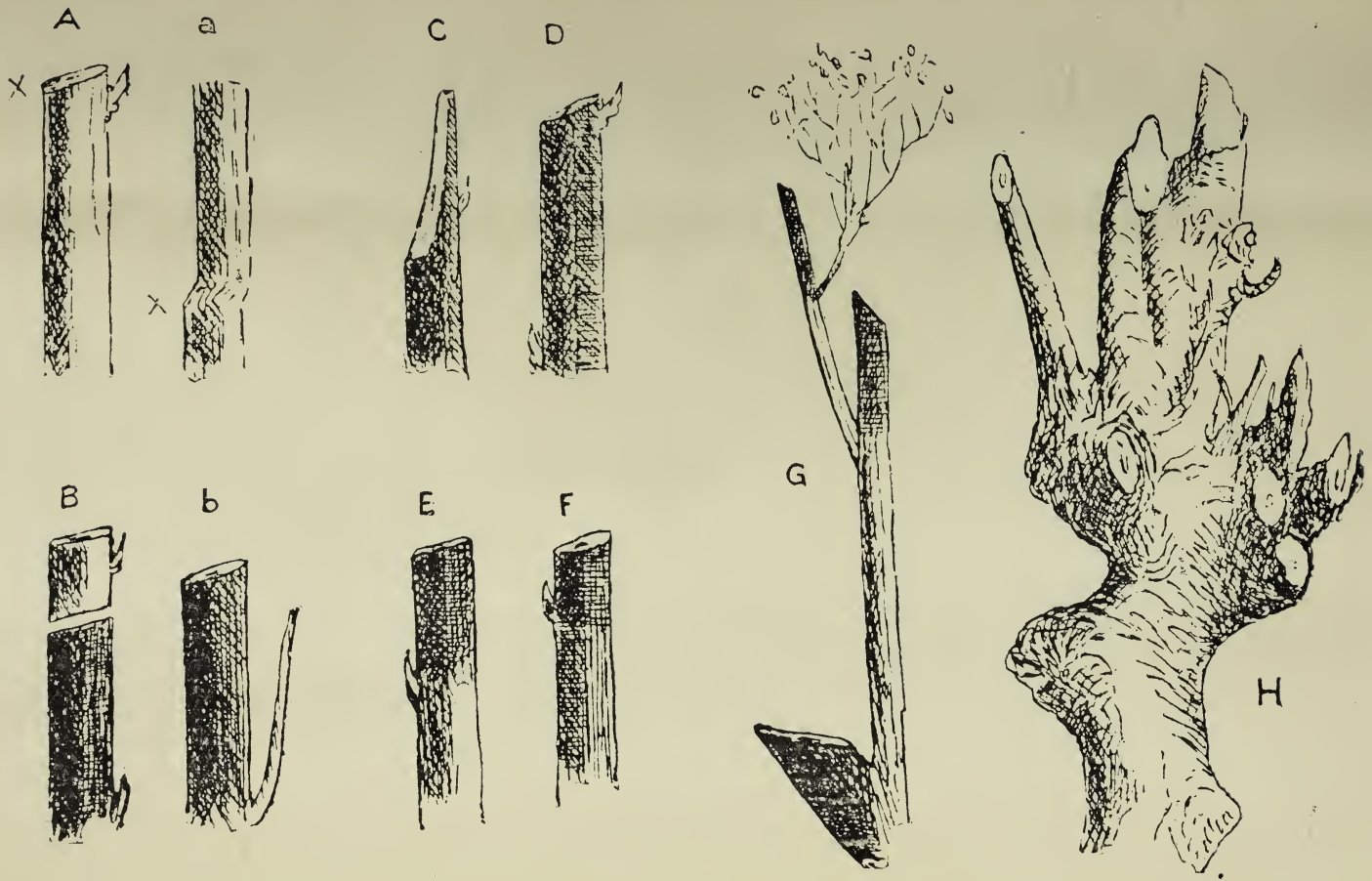
D The "cut to the quick:" The cut is made too low down and exposes to the drying action of the air the communication between the base of the bud and the interior of the stem; the consequence is that the bud dies and the new shoot not only does not come where it was expected, but is surmounted by a dead joint.

E In order to avoid the risk of the above "cut to the quick."

F Some unskilled labourers, not gardeners, make use of the snag cut E and F on which the wound is made on the same side of the branch as that occupied by the bud. This plan is, of course, objectionable.

G Shows the effect of snag pruning on the tea bush. It will be observed how quickly the original stout branch has thereby been reduced to a mere twig.

H The result of bad pruning, drawn "from Nature."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CHAPTER VIII.

COLLAR-PRUNING.

I EXTRACT under this heading from what I wrote on this subject two years ago, as an Essay on Pruning would not be complete without reference to this important work. I am convinced in the near future "collar-pruning," although, perhaps, in a modified form, will receive more serious attention in Ceylon than hitherto.

"I now come to the treatment of the bush, which from many years of pruning and very little manure, has become a collection of snags, and the circulation of sap is more than slow and uncertain. I do not know if what I am about to recommend has ever been tried in Ceylon. In Assam, 'collar-pruning' has proved very successful, and, although the conditions as to climate and soil are quite opposite, compared with Ceylon, it appears to me the matter is of considerable importance and is worth the attention of many proprietors in Ceylon."

"In a report just issued by the Government of India, and written by Dr. George Watt, an eminent authority, his investigations in Assam and Kangra are very interesting, and, as he has given his opinion on collar-pruning, I hope you will find space for the following extract. He prefaced the following remarks by stating 'collar-pruning properly performed gives a complete renovation to exhausted bushes'":—

"'Low Collar-Pruning Desirable.' During my visit to Melang on April 24, 1895, I had some conversation with the Superintendent of the Garden on the subject. An abstract from my diary may with advantage be here given:- Replied to Mr. Reid's inquiry that I most thoroughly approved of the principle of collar-pruning, but totally disapproved of the manner in which it was practised. In my opinion, the planters are far too timid in the treatment of the plant. The majority seem to be reluctant to part with the old wood, a surprising fact since it is the chief cause of the depreciated yield. Mr. Reid then asked me how I would propose to collar-prune. Replied that there seemed to be no doubt that the section should be made about a couple of inches below the surface of the ground, and that the wound should be immediately earthed over. Mr. Reid then remarked, 'I am very glad to hear you say that, for, some years ago, I came to the same conclusion. I cut down all the bushes of a large plot of land, and my friends told me I had made a race-course of it. I should like to take you to see the bushes as they are now."

"223.—The plot of land to which the above conversation had reference was one of the finest I had seen in Assam. I examined a number of bushes. the earth having been cleared away from the stems, and in every case no indication of the saw having been used could be found. Three, four, or more stout branches were seen to rise from the apex of what might be

described as a short, thick, underground stem, but these had so united together that all trace of the collar-pruning scar had been completely effaced. This is an example of how collar-pruning can be done with great advantage. But with a certain number of bushes, where the section across the stem had been made a few inches above ground, a very large percentage existed in the condition I have described, as a stump of old rotten wood. There could not be found a better object lesson of the two systems than the plot to which I allude."

From the foregoing it is very plainly laid down by Dr. Watt that when collar-pruning, "the section should be made a couple of inches *below* the surface of the ground and that the wound should be immediately earthed over." He condemns the operation if the section be made a few inches above the ground and, theoretically, one can understand it, as it would seem useless to form a new stem leaving several inches of the old one in an unhealthy condition as regards tissue, and incapable of allowing a free passage to the ascending and descending sap.

My readers will therefore be interested to read the following account of twenty-seven acres of Tea in Ceylon, subjected to the treatment of collar-pruning, but not in the orthodox manner advocated by the above author, as the section was made three or four inches above the ground.

The field is situated at an elevation of about 3,500 feet and occupies a ridge, though not particularly steep. The tea bushes were stunted and unprofitable, and the experiment of cutting them down was made in May, 1900. Samples of soil were analysed by Mr. Bamber, and the following manure applied:—

Nitrate of Potash ...	...	50 lbs.
White Castor ...	...	400 ,,
Basic Slag ...	...	150 ,,
Sulphate of Potash ...	...	50 ,,
		650 lbs. per acre.

In the following October I reported the field as coming on well. In January, 1901, I stated in my report, "the field had responded in a wonderful manner, and I had advised the Superintendent to leave it for another four months, and then to prune the centre wood down to eight inches."

In May following I stated in my report: "The bushes are now being cut down to eight inches, and also that the collar-pruning and the application of manure had quite resuscitated this plot."

I continued to report favourably of its progress, and in February, 1902, stated—"The field to which I drew attention in my last report has continued to thrive and shows very satisfactory results from the collar-pruning to which it was treated twenty-one months ago." I continued to report favourably. It is now March, 1903, and the Superintendent writes—

> "The 27 acre field has done very well, and has given, excepting our best field, a bigger yield than any other on the Upper Division."

Considering the miserable condition of the bushes before the collar-pruning was made, I hope the success achieved will encourage other planters to make the experiment; I have placed the bare facts before my readers.

"RUSTIC."

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